

rotor. If the coil is removed, the magnetism will be lost, and it weakens the magneto if this magnetism is not replaced. Therefore, it becomes necessary to re-charge the magnet after replacing the coil bridge.

When assembling the coil, be sure to lay the insulating strip beneath the coil, so it extends approximately $\frac{1}{2}$ " above the gasket on the frame at the flange end, as shown in Figure 35. After coil has been installed, pull insulating strip up tight against the coil so rotor does not strike strip.

Hold new coil in same position as the one removed, with connecting wires toward the bearing plate.

When starting to assemble the coil bridge laminations into the pole piece laminations, start one lamination at one edge and roll through like a gear would mesh as shown in Figure 35, being careful that the side of the bridge with the short lamination is meshed between the first two laminations of the pole piece.

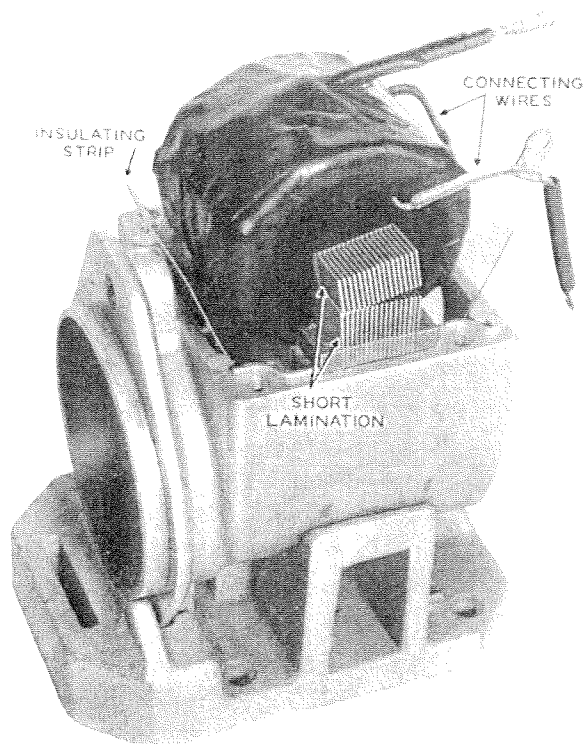


Figure 35. Assembling Coil in Frame

Interlock the laminations in the coil with those in the frame and drive gently, a short distance, with composition mallet.

Place the magneto in frame supporting stand (special tool No. 2CMT) on the table of the arbor press. Put the yoke, for pressing coil in pole piece, and the ram of the arbor press. Press the coil firmly

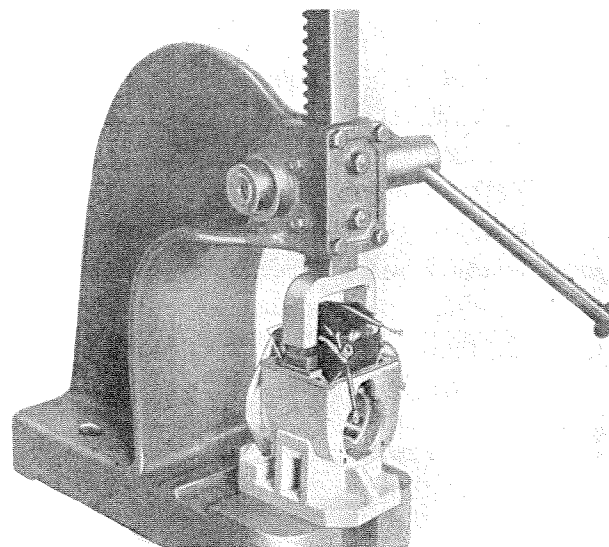


Figure 36. Pressing Coil Into Place

back into place, Figure 36. Do not drive with hammer, as you will distort frame so rotor will rub.

SPARK CUTTING OUT AT HIGH SPEED

Should a magneto spark correctly when turned by hand, refer to "Test to Make Before Disassembling Magneto," then run it at full speed on the synchroscope. If the spark cuts out at full speed, it indicates that the breaker arm is sluggish on the fulcrum pin. This must be free and can be remedied by cleaning as in "Breaker Arm and Contact Points."

TIMING OF THE IMPULSE AND RUNNING SPARK

Should the magneto spark correctly when turned by hand, refer to "Tests to Make Before Disassembling Magneto." If it still sparks correctly when run at full speed, the timing of the magneto must then be checked on the synchroscope, Figure 20. The running spark should occur the number of degrees ahead of the

impulse spark as indicated by the arrow on the stop pin plate, Figure 37.

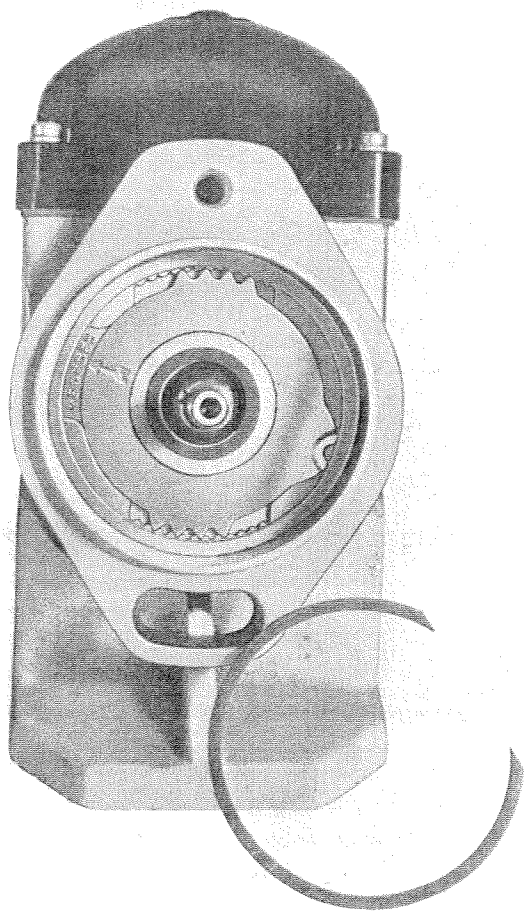


Figure 37. Setting of Stop Pin Plate

The impulse coupling timing should only be tested while the magneto is being turned by hand very, very, slowly on the synchroscope, until the impulse clicks and spark occurs, as shown in Figure 38. Move the graduated sector of the synchroscope to the same number of degrees after "O" in the direction of rotation, as the number of degrees shown by arrow, on the stop pin plate, Figure 37. When operating synchroscope to running speed of the magneto, adjust contact points until spark occurs at "O" on synchroscope as shown in Figure 29. Note "Timing Magneto." (The stop pin plate shown in Figure 37 is adjustable from "O" to 35° lag, which makes this adaptable to most right hand rotating engines with enough clearance for this magneto).

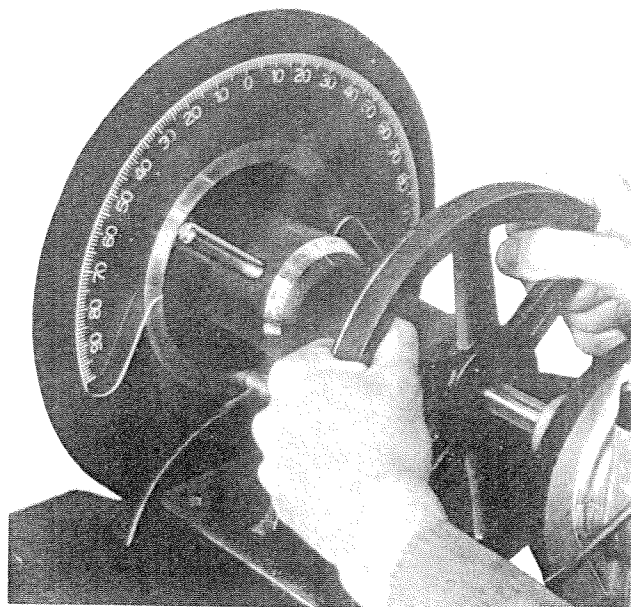


Figure 38. Turning Magneto by Hand

If, in timing the magneto, it is found that the cam is worn so that in order to properly time the magneto the contact points open too far, it is possible to reverse (turn over) the cam, thus creating the same condition as a new cam. Pull off the steel gear on the

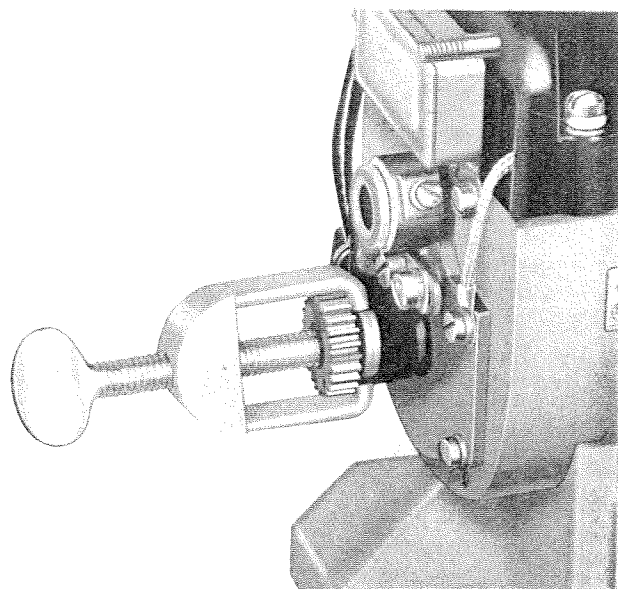


Figure 39. Removing Steel Gear

rotor shaft, Figure 39, and pry off the cam, Figure 40. Reverse the cam and reinstall the steel gear. At this point the opening should be the correct amount

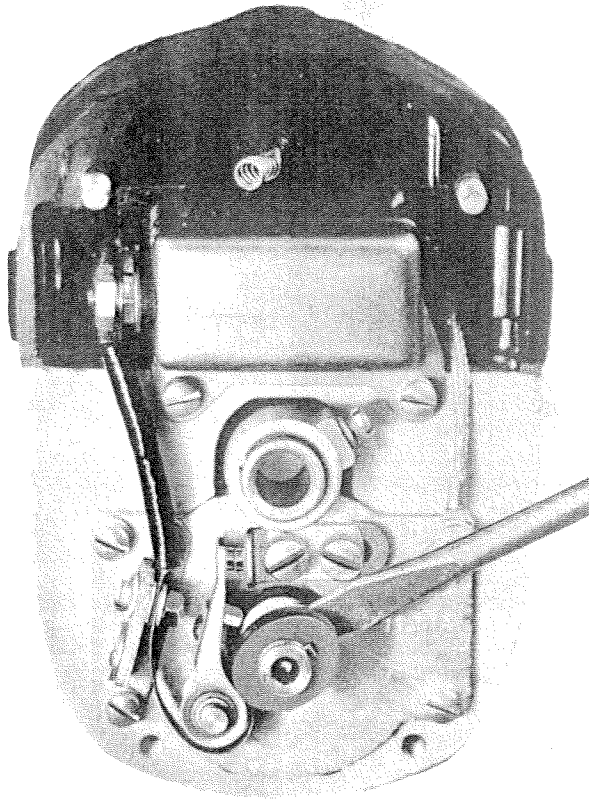


Figure 40. Removing Cam

when the spark occurs at the right time. The timing of the spark may be changed by adjusting the contact

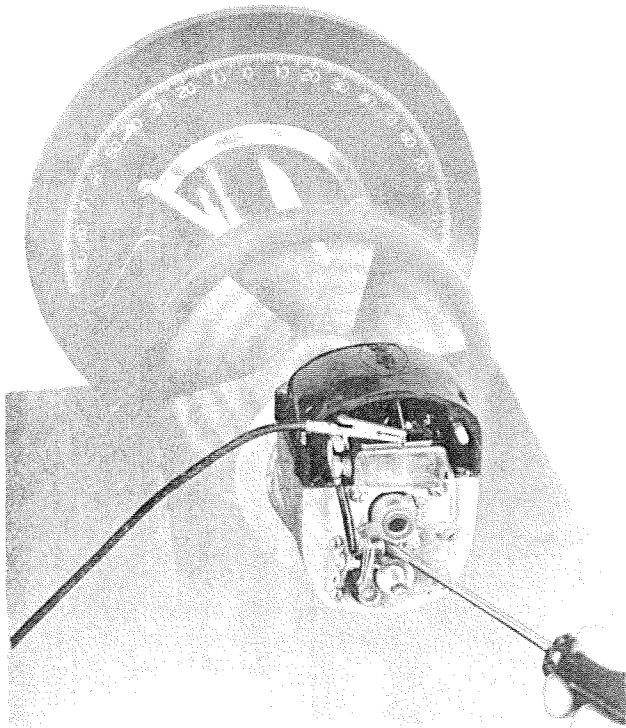


Figure 41. Adjusting Contact Points with Magneto Running on Synchroscope

points, while the magneto is being run on the synchroscope, Figure 41. Closing the gap tends to retard the spark, while opening it tends to advance the spark. This should take care of the necessary adjustment and still remain within the tolerance of our opening. If not, a new cam should be installed and the magneto timed again.

When the running spark occurs at "O" on the protractor, the "O" on the hub of the protractor should be in line with the mark on the bracket as shown at Figure 29. This indicates the driving lugs are horizontal when the running spark occurs. (See SAE 1940).

FINAL CHECK OF DISTRIBUTOR CAP AND POINTS

If the magneto sparks satisfactorily in test outlined in "Timing of the Impulse," remove the distributor cap and see if there is any dirt or grease left between contact points which could have caused the magneto to fail. The primary wire should be away from the coil, as shown in Figure 32.

When points are dirty or discolored, clean as in "Breaker Arm and Contact Points." The contact points should have a frosted silver appearance on contact surface. Open circuit would be broken wire, loose connections, defective soldering of terminals (end of primary wire and ground wire and condenser terminal) and defective soldering of stranded wire to wire at coil.

Retest as in "Timing of the Impulse."

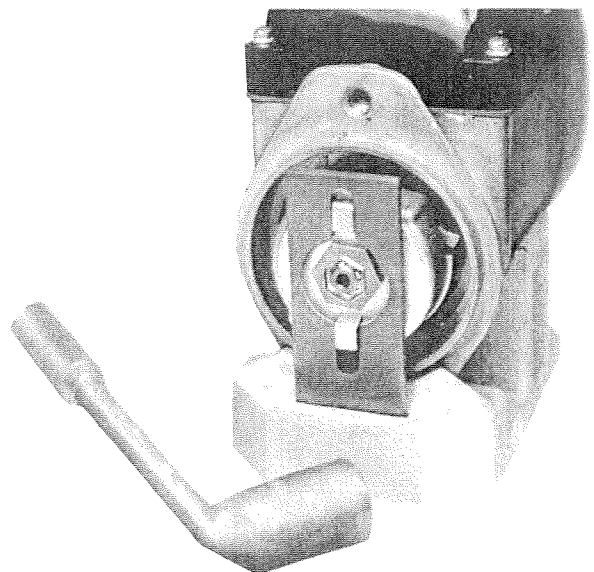


Figure 42. Removing Impulse Coupling Nut

IMPULSE COUPLING

When, in checking as outlined in "Tests to Make Before Disassembling Magneto," the impulse coupling does not work according to instructions, remove from the magneto.

Set the magneto in the magneto frame supporting stand.

Place impulse lug wrench on the impulse coupling lugs and lock in the supporting stand.

Using a socket wrench, unscrew the Pal-Nut and the nut holding the impulse coupling, Figure 42.

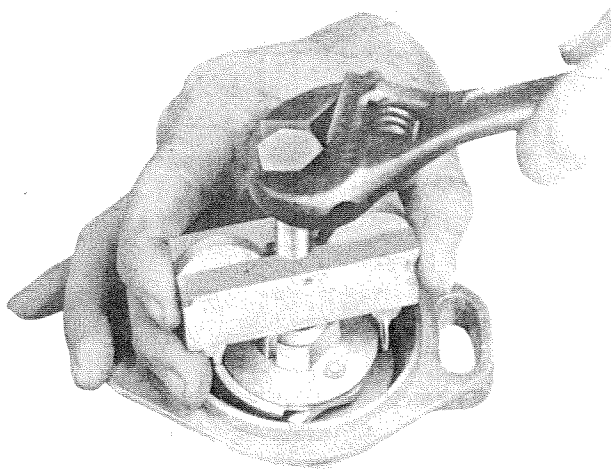


Figure 43. Removing Impulse Coupling

Apply the impulse coupling puller to the coupling and the end of the shaft, Figure 43. Turn the cap screw to pull the impulse coupling. If the impulse does not come off, after the cap screw is tight against the shaft, tap the end of cap screw lightly with a hammer. The shock will loosen the impulse hub.

With the impulse coupling off, check for mechanical defects. The impulse coupling hub should be free in the impulse shell, with the spring holding it against the stop in the shell. The impulse pawls should be very free on the bosses on the impulse coupling hub. The end of the pawls, which strike the stop pin, should not be worn or broken off at the corner which drags over the stop pin. Stop pin should have a small amount of grease. Do not use any grease on the bosses of the impulse where the pawls fulcrum. A very light oil at time of overhaul would be desirable.

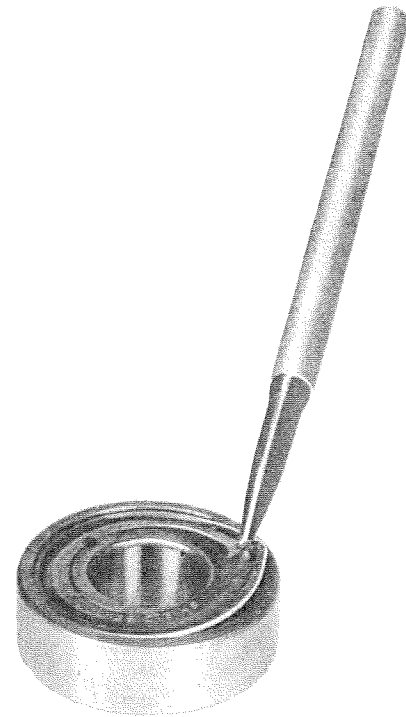


Figure 44. Removing Shield From Bearing

BEARINGS

The 4JMA magnetos have been equipped with No. 77502 Shielded Ball Bearings. When these bearings have had three or four years of service or at first major overhaul, it is desirable to clean and re-pack with fresh lubricant as any lubricant has a tendency to become dry and hard or oxidize. This bearing has a shield in both sides.

To clean, remove shield from *one side* of bearing. This can be done with a sharp pointed tool as shown in Figure 44.

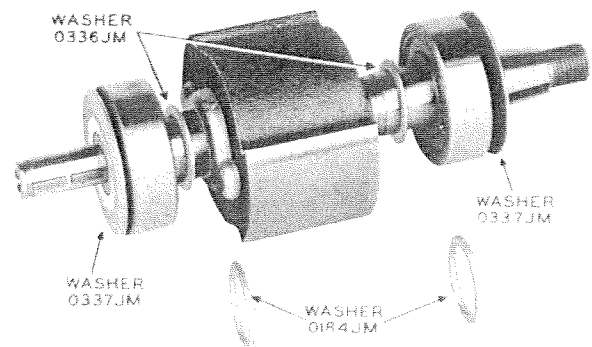


Figure 45. Bearing Assembly with Shield Removed

When reassembling the bearings on the shaft, replace the 1/16" thick No. 0184JM Washer with the 1/32" thick No. 0336JM Washer to make room for the No. 0337JM Retaining Washer which replaced the shield. Figure 45.

Some of the recent magnetos were manufactured with one shield bearing.

We now equip these magnetos with the No. 0-46CM Magneto Type Ball Bearings. One lip of the inner race of the ball bearing is ground off so the inner race can be removed, leaving the ball retainer in the outer race assembly in the frame or bearing plate. The outer race is held in the bore with

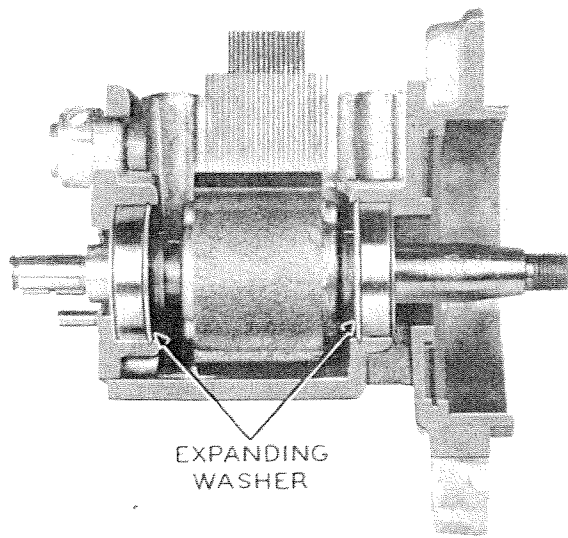


Figure 46. Expanding Washer First Assembly

an expanding washer. The washer is concave and when pressed flat has a taper on the outer diameter

making a sharp edge, which cuts into the wall, locking itself tight in the bearing bore. This makes an oil tight seal to keep the grease in the ball bearings. In assembling this the first time, the sharp edge is next to the outer race, Figure 46. When reassem-

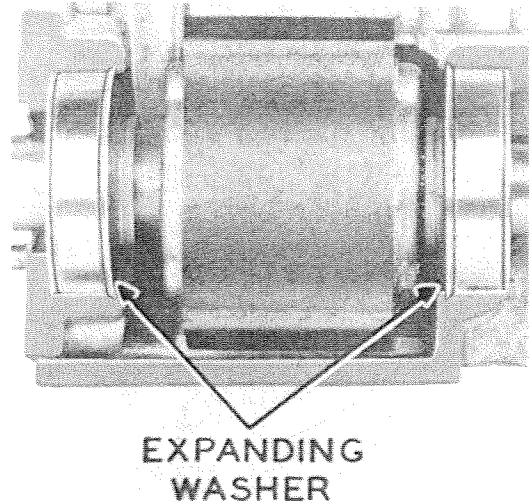


Figure 47. Expanding Washer Second and Succeeding Assemblies

bling this washer into bearing bore the second time, or there after, the cutting edge should be out away from the outer race as shown in Figure 47.

You can replace the No. 77502 Bearings with the No. 0-46CM Bearings by adding spacer washers as shown in Figure 48. After these bearings are assembled in place, there should be .001" to .005" end play in the rotor. This can be adjusted by using Shim Washers Nos. 0331CM and 0332CM in back of the inner race of the ball bearings.

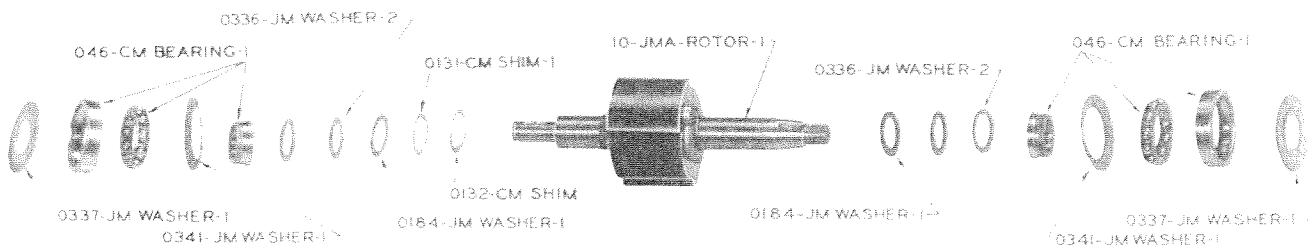


Figure 48. Adding Washers with No. 0-46-CM Bearing

OILITE DISTRIBUTOR BEARING

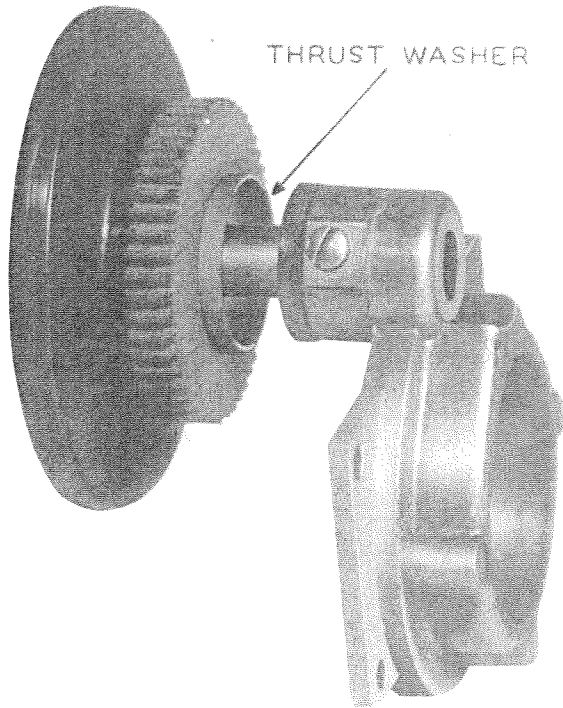


Figure 49. Flange Type Oilite Bearing with Thrust Washer

These magnetos have been equipped with a flange type Oilite bearing. With this bearing it is necessary to have a thrust washer No. 0-292JM, Figure 49.

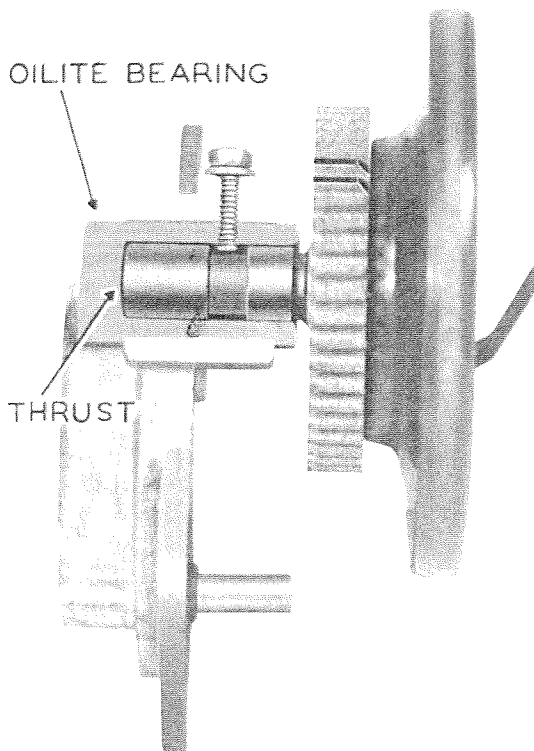


Figure 50. Closed End Oilite Bearing

Our later Magnetos are equipped with a closed end oilite bearing, Figure 50, which moves the thrust to the end of the shaft which fits into the bearing. With this bearing, the thrust washer is not used and there is $1/32$ " clearance between the distributor gear and the open end of the bearing, Figure 50.

DISMANTLING MODEL 4-JMA MAGNETO

Impulse Coupling

Use magneto frame supporting stand, impulse lug wrench, and socket wrench as outlined in "Impulse Coupling."

Distributor Cap

Using screw driver, take out two screws and two nuts and remove distributor cap as indicated in "Remove the Distributor Cap."

Top Cover

Remove four screws, and lift up cover.

Distributor Disc and Gear

Remove screw and draw the distributor disc assembly forward out of the bearing, Figure 16.

Rotor Drive Gear

Remove snap ring and pull off steel gear with gear puller, Figure 39.

Breaker Bar

Remove breaker spring screw and pull off breaker bar, Figure 32.

CHARGED AFTER INSERTING ROTOR IN THE FRAME, Figure 21.

BEARINGS

No. 77502—Shield Bearings

Remove by pressing off shaft as in Figure 52.
Remove shield as in Figure 44.

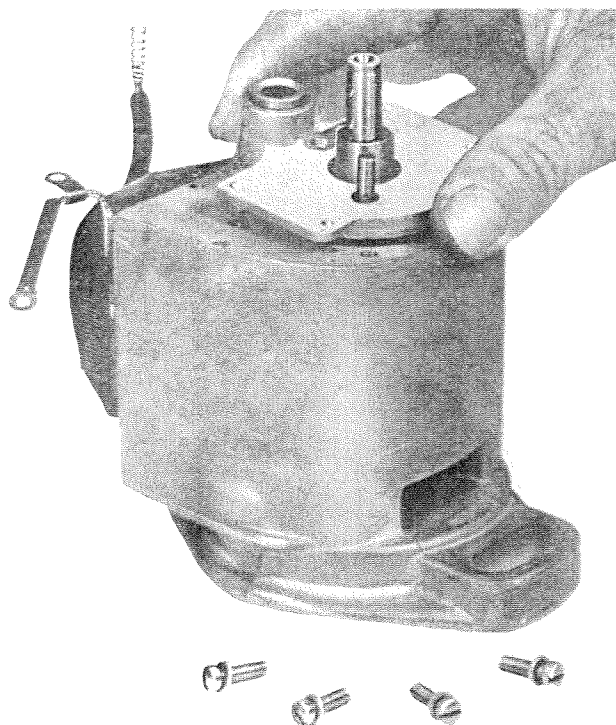


Figure 51. Removing Bearing Plate

Bearing Plate

Remove four screws and take off bearing plate, Figure 51.

Rotor

Draw rotor out of frame, REMEMBER THAT THE MOMENT THIS IS DONE, THE MAGNET IS WEAKENED, AND IT MUST BE RE-

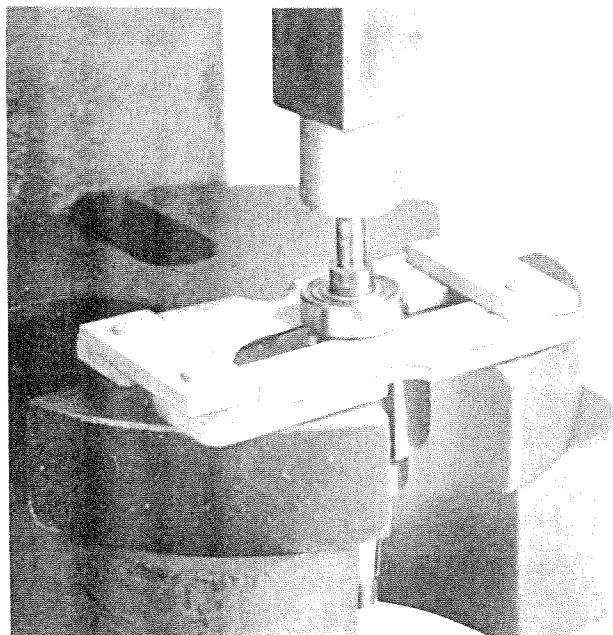


Figure 52. Removing No. 77502 Shielded Bearing



Figure 53. Removing Expanding Washer

No. 0-46CM—Bearing

Remove expanding washer by pressing out with screw driver or punch as shown in Figure 53.

Removing Bearing Inner Races

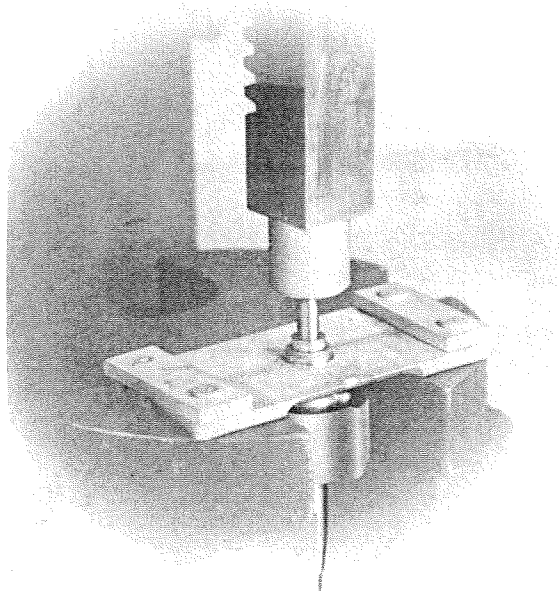


Figure 54. Removing Inner Race

Use the gear and ball bearing puller 4-CMTA as shown in Figure 54. Place the bearing driver in the ram of the arbor press and press the shaft out of the inner race.

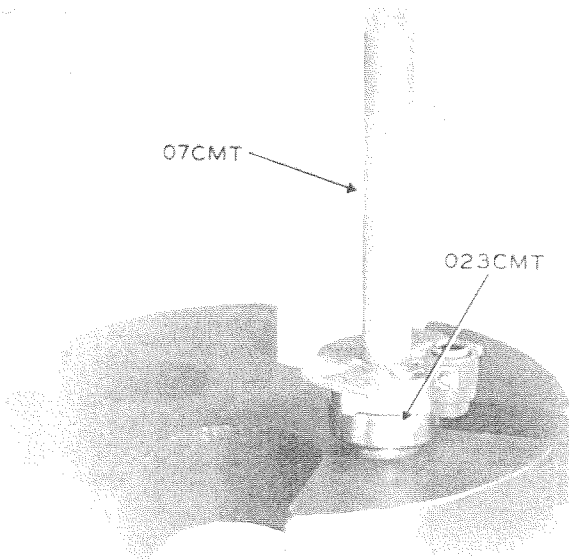


Figure 55. Removing Outer Race

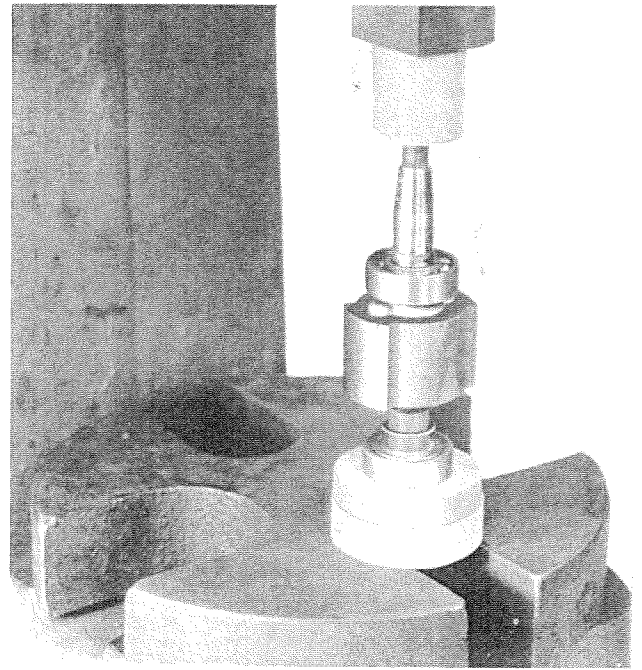


Figure 56. Assembling Bearings on Rotor Shaft

Remove Outer Race from Bearing Plate

Use No. 07CMT to push outer race of bearing plate on tool No. 023CMT, as shown in Figure 55.

Replacing Bearings

Place the tool No. 0-15CMT, for assembling bearings on the shaft, on the table of the arbor press. Place tool No. 0-16CMT in the ram of arbor press. Be sure No. 0-336JM End Play Washers, are on shaft. Place the ball bearings on the shaft and press into place, Figure 56. Turn rotor upside down and press on other bearing.

Use same tools for assembling inner races of No. 0-16CM Bearings, when used.

When assembling No. 0-16CM Bearing Outer Races in the 4JMA magneto frame use tools Nos.

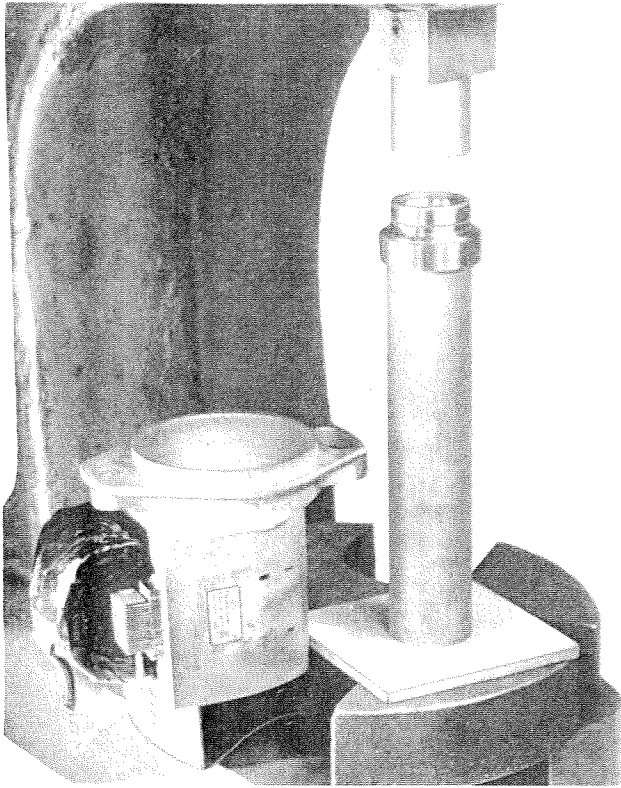


Figure 57. Assembling Outer Race in Frame

0-16CMT, 13CMTA, 0-23CMT, as shown in Figure 57.

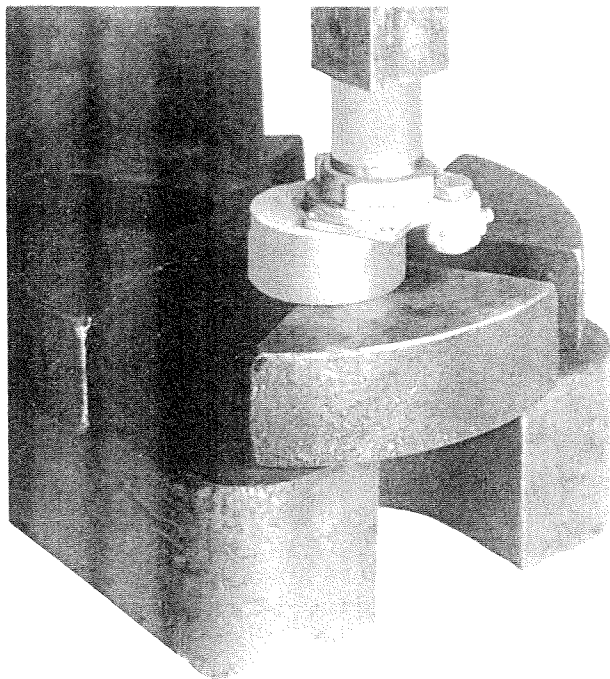


Figure 58. Assembling Condenser

Assemble outer race in bearing plate. See Figure 58.

Condenser

Remove nut and primary lead terminal and take out two screws.

Coil

Use the coil puller, as shown in Figure 33, and described in "The Coil."

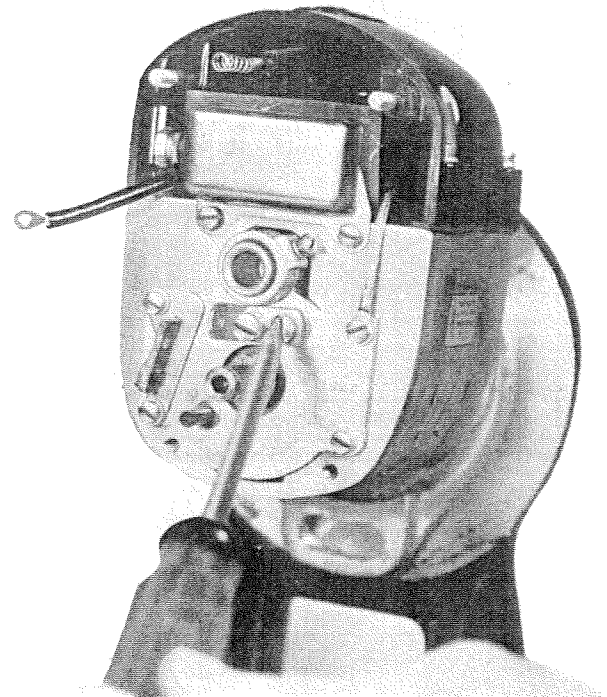


Figure 59. Stationary Contact Point

Stationary Contact Point and Support
Remove two screws and clamp plate, Figure 59.

REASSEMBLING MODEL 4-JMA MAGNETOS

CAUTION:

Be sure all parts are clean before assembly. Do not try to clean one part and then assemble it, as there will be too much dirt getting into the magneto. Support the magneto frame in the magneto frame supporting bracket. This will hold the magneto in position for most operations.

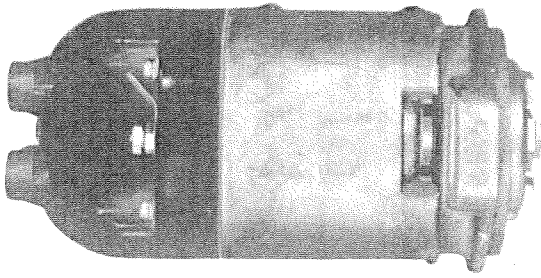


Figure 60. Ventilating Hole

Magneto Frame

Clean thoroughly, being sure ventilation hole next to flange is open. The purpose of this hole is to drain out any oil which may leak by the oil seal, thereby preventing it from entering the magneto. See Figure 60.

Check oil seal. If worn, replace with new one.

Coil

If necessary to replace coil, place it in frame, Figure 35, starting interlacing bridge with the pole pieces. Press into place as shown in Figure 36. For complete explanation see, "The Coil."

Condenser

Install it on the frame. Make certain both screws are tight on lock washers.

Rotor

With bearings mounted on rotor shaft, as outlined in "Replacing Bearing," insert rotor in frame. Be sure both rotor and frame are clean. Press rotor in with hand; bearings should not be tight.

Bearing Plate

This should be assembled in place. Make sure grounding wire is fastened under upper right hand screw, and the breaker bar spring support is assembled on the bearing plate.

CAUTION:

When assembling the bearing plate, tighten screws evenly. If this is not done, it will cause the rotor to rub on pole pieces.

Stationary Contact Point

Should be assembled with locking plate held by two screws, Figure 59.

Breaker Bar

Should be assembled in place. Requiring 15 to 18 ounces on rubbing block to open contact points.

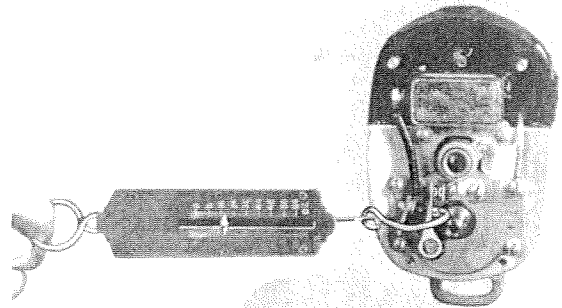


Figure 61. Checking Breaker Bar Spring Tension

Figure 61. Be sure the terminal on the lead wire from the coil is between the breaker bar spring and spacer washer. There should also be a lock washer under head of screw, as well as nut, Figure 62.

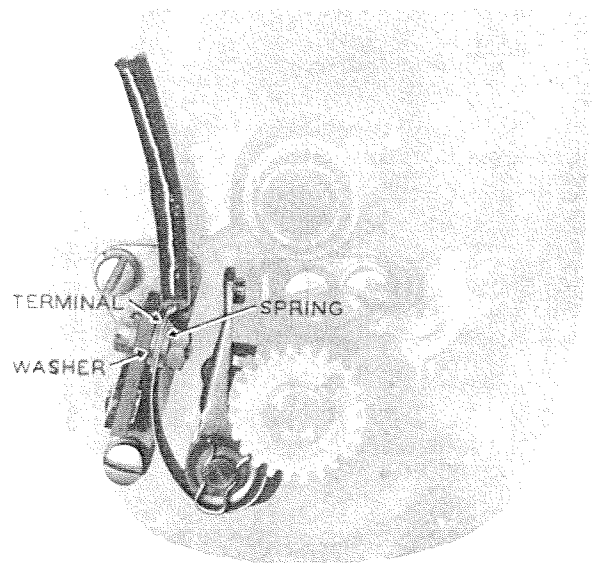


Figure 62. Primary Lead Terminal and Breaker Spring Assembly

Cam

Is assembled on rotor shaft. Make sure the Woodruff key is in place. Be very careful to start key in the cam keyway, to prevent shearing the cam. After cam is in place on shaft, put a small amount of CASE grease on surface of cam which strikes breaker bar

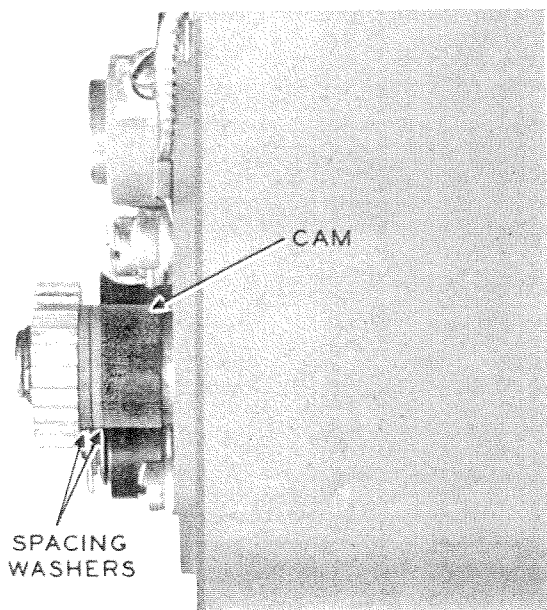


Figure 63. Cam, Spacing Washers and Steel Gear

rubbing block. Wipe off excess, leaving a very light film of grease on cam, Figure 63.

Two Spacing Washers

Should be placed on the shaft following the cam, Figure 63.

Steel Gear

Should be assembled on the shaft, making sure the Woodruff key which holds it, is in place, and the face with the red dot is on the outside, Figure 63.

Top Cover

Examine top cover gasket to be sure it is not broken. Be sure primary wire lock nut and lock washer are tight on the condenser terminal; then put top cover in place. Be sure insulating strip is inside the cover at flange end of magneto.

Charging Magnet

In charging the magnet through the frame, place the frame between the blocks on the ends of the

charging coil poles so that keyway on the rotor driving shaft is in the horizontal position. Keep in mind that the keyway is at the North Pole side of the magnet, Figure 21.

Impulse Stop Pin Plate

Be sure and use Screws No. 0167JM, as standard screw heads interfere with the impulse coupling pawls. The later magnetos are equipped with a snap ring which holds the stop pin plate in place. Be sure, when assembling this, that you press the snap ring to the bottom of the groove so it cannot jump out. After the stop pin plate, is assembled in frame it is desirable to place a small quantity of grease on that part of the stop pin plate where the pawl strikes. See Figure 37.

No. 30JMA Impulse Coupling

Make sure hub is free in the shell, and that the spring is attached to the hub and shell of the impulse. Be very careful when bending lips over spring, that you do not distort or bend spring support as this will cause spring to bind or be eccentric with shaft. This can best be done by starting lip over with pliers, then

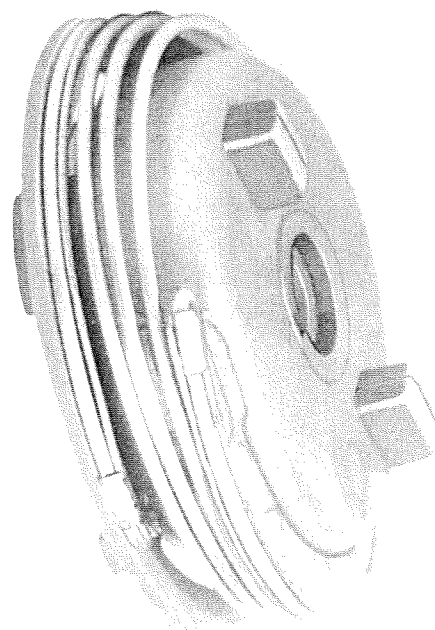


Figure 64. No. 30JMA Impulse Coupling

tapping it down with a light hammer, Figure 64. The spring should be free under lip after it is bent over. The spring should lay parallel with groove, before it is wound into position.

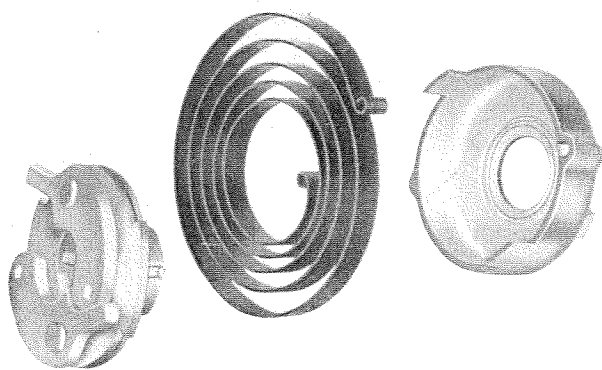
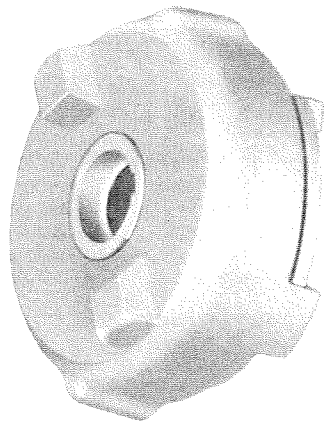


Figure 65. No. 109JMA Impulse Coupling

No. 109JMA Impulse Coupling (Figure 65)

The later magnetos are equipped with a new style No. 109JM Impulse Coupling which is interchangeable with the No. 30JMA Impulse Coupling. However, no individual parts are interchangeable. Be sure the hub is free in the shell before assembling the spring in place. This spring can be assembled with our No. 5 CMTA Tool as shown in Figure 66.

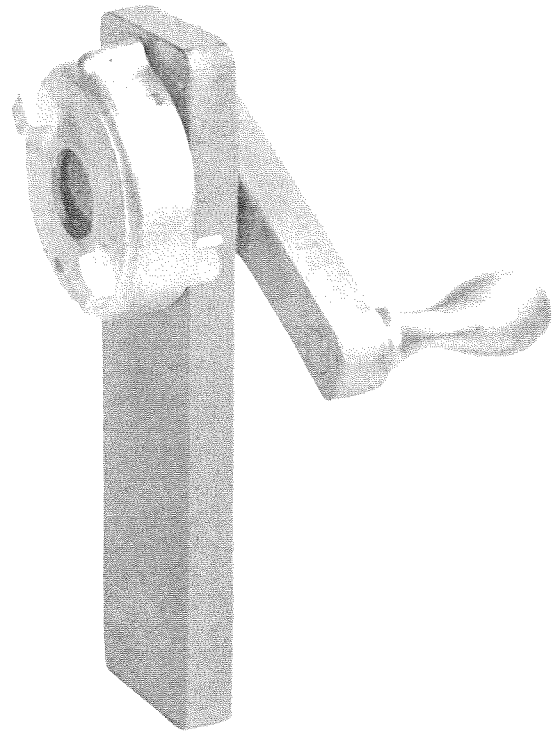


Figure 66. Assembling Impulse Spring

Assembling

Place Woodruff key in keyway on rotor shaft and assemble coupling on the rotor shaft. Be very careful not to push key out of keyway in shaft. Key can be seen in the keyway after impulse coupling is in place.

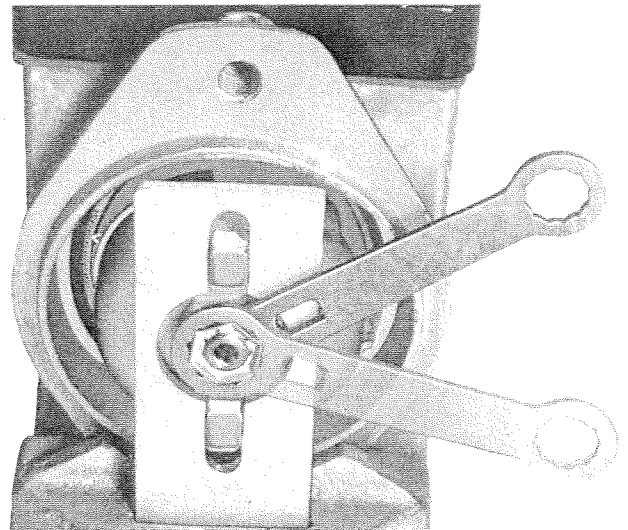


Figure 67. Tightening Pal-Nut

Locking on Shaft

Assemble nut on shaft. Tighten nut securely. Install Pal-Nut tightly with fingers, then turn $\frac{1}{4}$ with

wrench, as shown in Figure 67. *Do not turn this nut too tightly as it would lose its locking ability.*

Testing Timing on Synchroscope

Place magneto on synchroscope and test as outlined in "Timing of Impulse," also Figures 29, 37, and 38. Check position where impulse trips by turning magneto very slowly by hand. When the magneto is in motion, there is always a lag in the time when the spark occurs.

Opening of Contact Points

When the magneto is timed correctly, there should be .011" to .020" between the contact points when the rubbing block is on the high point of cam. Test as in "Timing of Magneto," also Figure 41. **IT IS BETTER TO HAVE THE CORRECT TIMING OF THE MAGNETO THAN A GIVEN AMOUNT OF POINT OPENING.**

When everything is mechanically correct, the amount of point opening should be .015".

Distributor Disc

Should be clean. The face of disc where brush rubbed should be smooth. If there is a black track on the face caused from brushes, remove with an ink eraser, Figure 17.

CAUTION:

DO NOT USE SAND PAPER OR EMERY CLOTH ON BRUSH TRACK.

On the earlier disc, we riveted the springs to the Monel Metal insert, Figure 17. When this spring becomes worn or broken, it can be replaced by drilling a .098" diameter hole, $\frac{1}{8}$ " deep in the rivet and replacing Spring No. 0-140JM, using Screw No. 0-331JM which will cut its own thread when assembling, Figure 19.

Distributor Gear Assembly

Can be placed in frame, using care to match marked gear teeth. Tooth over red dot on steel gear

should be placed between the two bevelled teeth on the bakelite gear. Bevels should be on side of gear next to distributor disc. See "Checking Gear Drive," Figure 15.

Distributor Cap

Make sure distributor cap gasket is not broken. Be sure the brushes are free in the distributor block as shown under "Distributor Disc." Test with tips of fingers. You should not be able to make these stick in any position. Be sure center brush is not worn down below brass retainer. If it is to be replaced, remove the old brush. Assemble new one in place and drive into position with driving tool for center brush and composition mallet. Be sure and tap gently.

After assembling distributor disc, Figure 14, and distributor cap, Figure 13, check as in "Test to Make Before Disassembling Magneto," to see if magneto is good and grounding terminal grounds magneto.

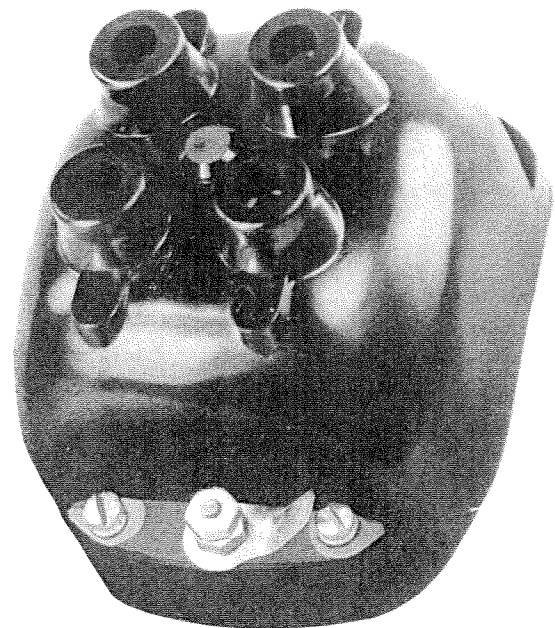
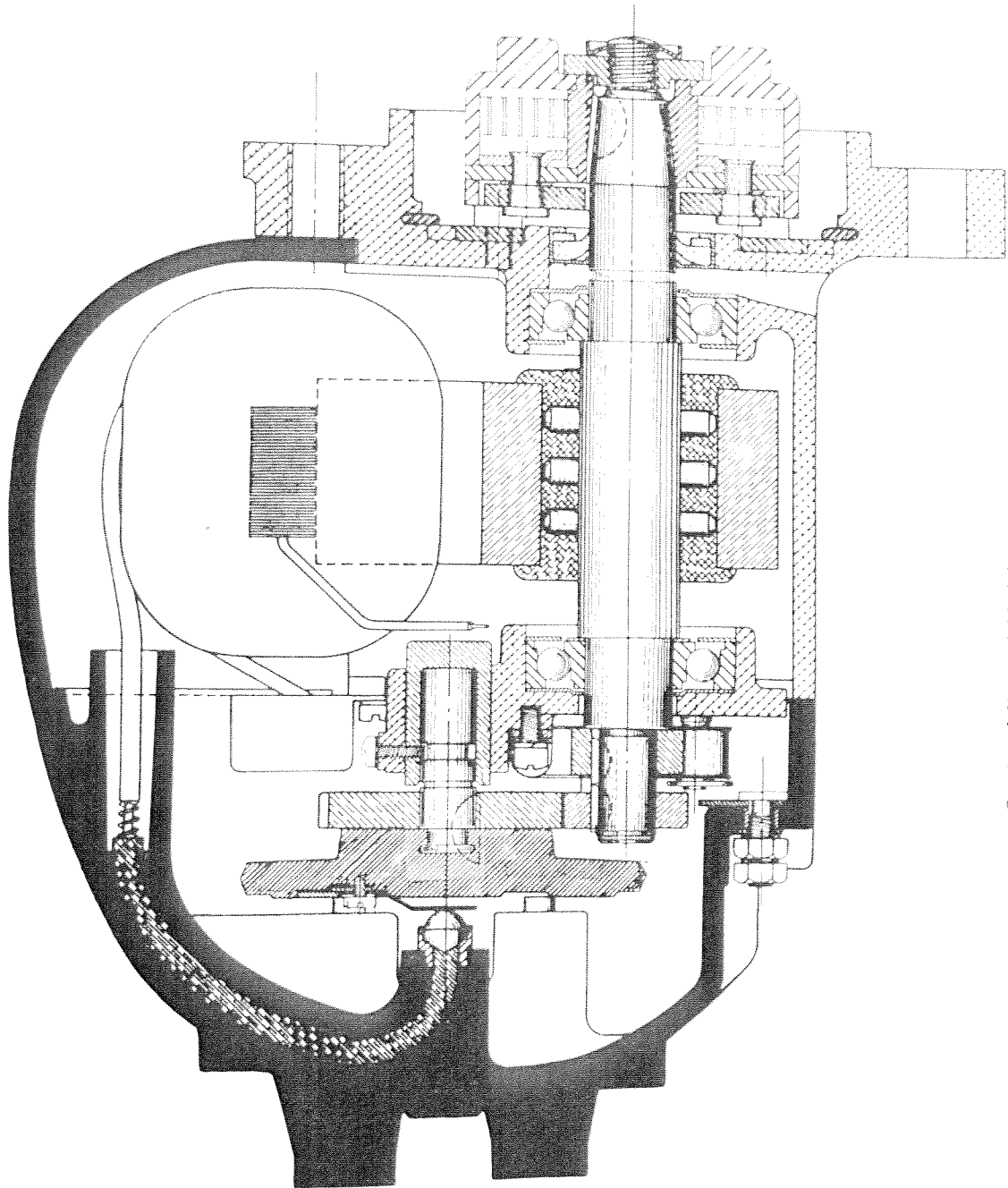


Figure 68. Grounding Spring

If magneto does not ground out when you press the outside grounding spring to the screw, Figure 68, remove the distributor cap, bend inside grounding spring, Figure 20, so it will touch breaker spring screw when cap is replaced.



Sectional View of Model 4-JMA Magneto

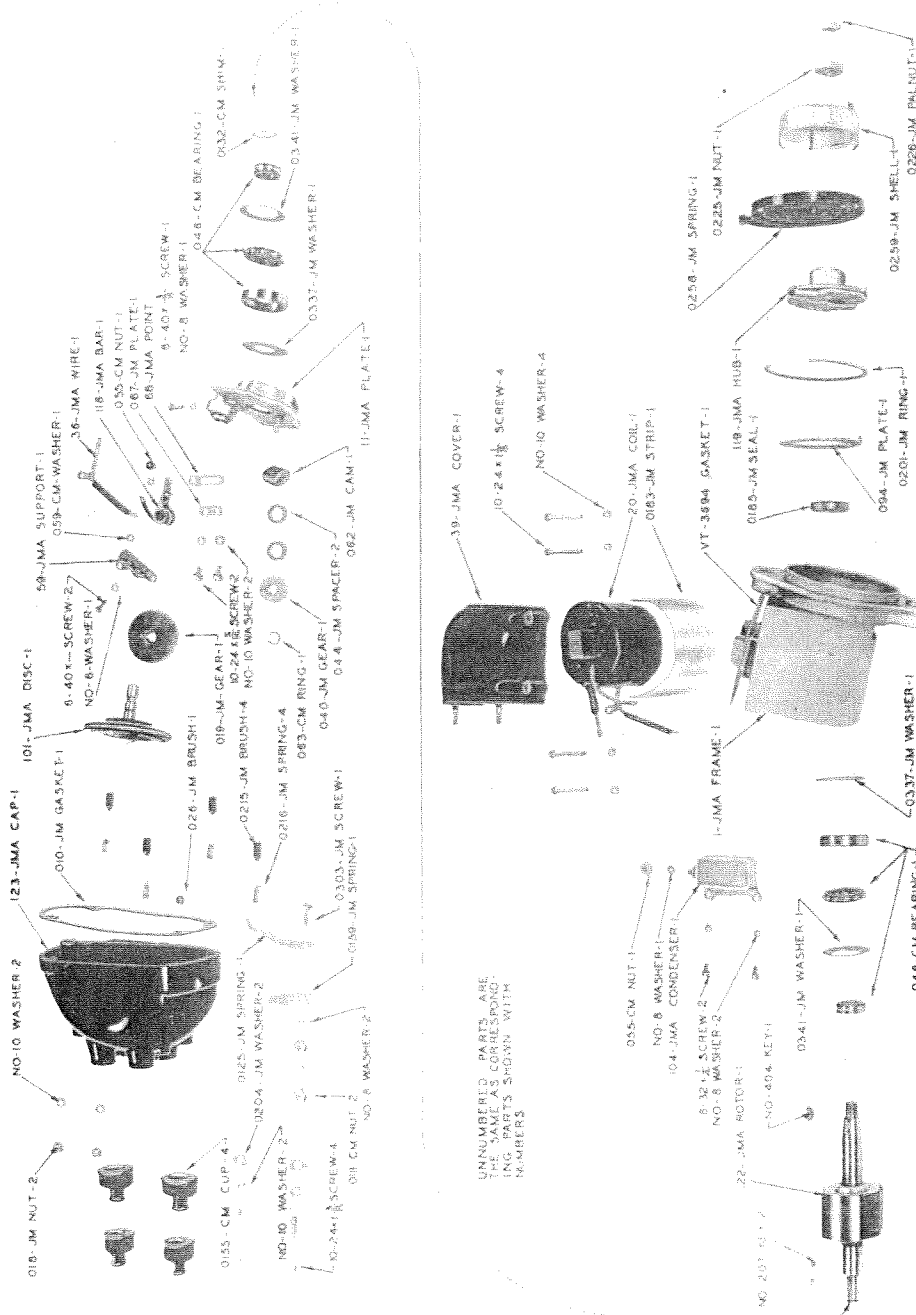


Figure 69. Exploded View of Model 4-JMA Magneto